

شرح الدرس الرابع Isomers Hydrocarbon من وحدة Hydrocarbons منهج انسابير



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المزيد من مادة
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التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم



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المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة كيمياء في الفصل الثالث

شرح الدرس الثالث Alkynes and Alkenes من وحدة Hydrocarbons منهج انسابير

1

شرح الدرس الثاني Alkanes من وحدة Hydrocarbons منهج انسابير

2

شرح الدرس الأول hydrocarbons to Introduction من وحدة Hydrocarbons منهج انسابير

3

حل مراجعة نهائية وفق الهيكل الوزاري الخطة C

4

الهيكل الوزاري الجديد منهج انسابير الخطة M المسار المتقدم

5

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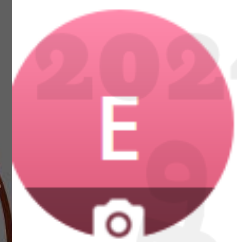
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CHEMISTRY

“Hydrocarbons”

Hydrocarbon Isomers

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Inspire Chemistry

Module 20

“Hydrocarbons”

Hydrocarbon Isomers

Learning Outcomes:

- **Distinguish** between the two main categories of isomers—structural isomers and stereoisomers.
- **Differentiate** between geometric isomers with cis- and trans prefixes.
- **Describe** the structural variation in molecules that results in optical isomers.

cis - ~~~~~

trans - ~~~~~

انسانی

2023-2024

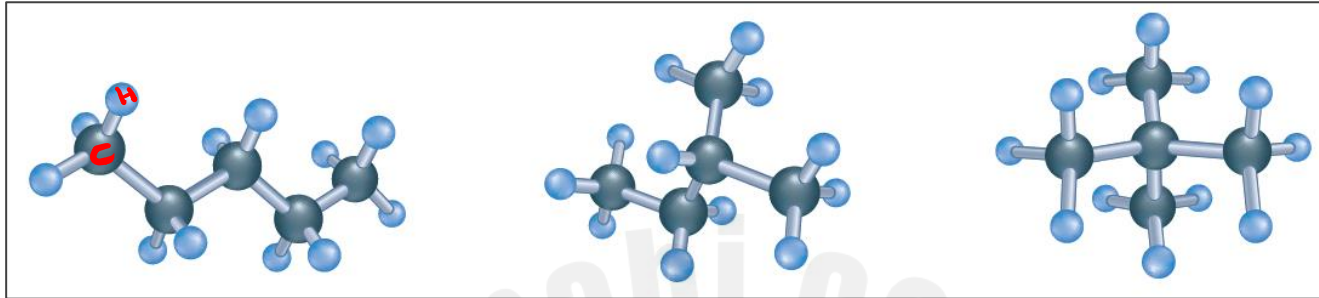
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11 adv Plan-C



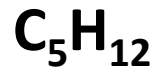
Starter

What is the model used here?



Structural formulas
using the ball and
stick model

**Molecular
formula**



IUPAC Name:

Pentane

2-Methylbutane

2,2-Dimethylpropane

**What are the differences among
these compounds?**

Introduction

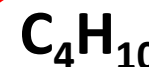
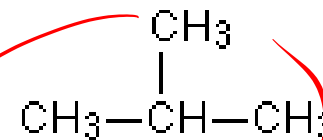
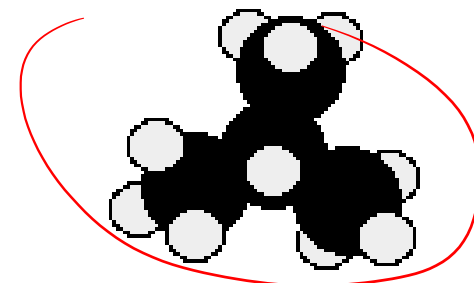
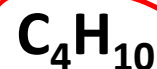
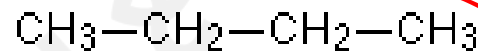
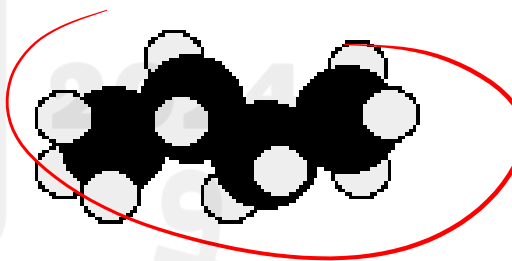
- **Hydrocarbon Isomers:**

- Some hydrocarbons have the same molecular formula but have different molecular structures.

Have you ever met a **pair of identical twins**?

Identical twins have the same genetic makeup, yet they are two separate individuals with different personalities.

Isomers are similar to twins—they have the same molecular formula, but different molecular structures and properties.



Structural Isomers


- **Isomers** are two or more compounds that have the same molecular formula but different molecular structures.
- There are two main classes of isomers:
 - ① structural isomers ✓
 - ② Stereoisomers ✓
 - @ Geometric Isomers ✓
 - ⑥ Optical Isomers

12 عدد
11 عدد


Quiz

1. What is the name of two or more compounds with the same molecular formulas but different molecular structures?

 telomeres

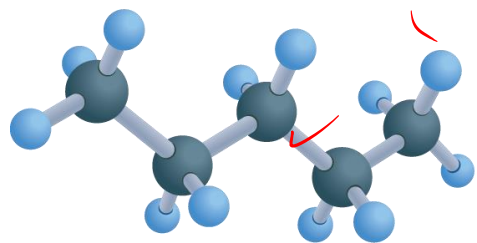
 chiral molecules

c isomers **CORRECT**

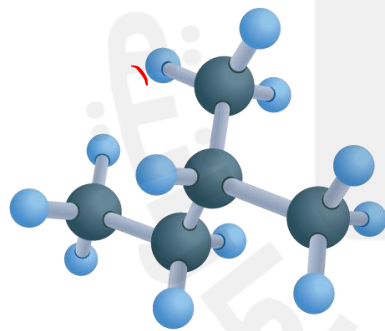
 Compounds with the same molecular formulas never have different molecular structures.

Structural Isomers

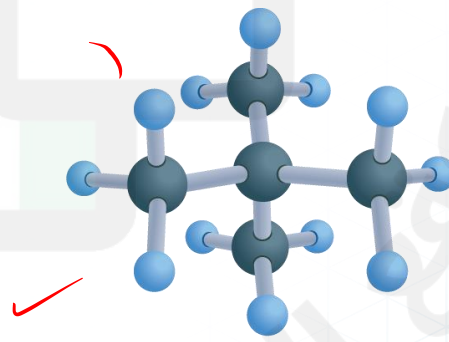
- Structural isomers have the same chemical formula, but their atoms are bonded in different arrangements.
- Structural isomers have different chemical and physical properties.
- The structure of a substance determines its properties.



Pentane
(bp = 36°C)



2-Methylbutane
(bp = 28°C)



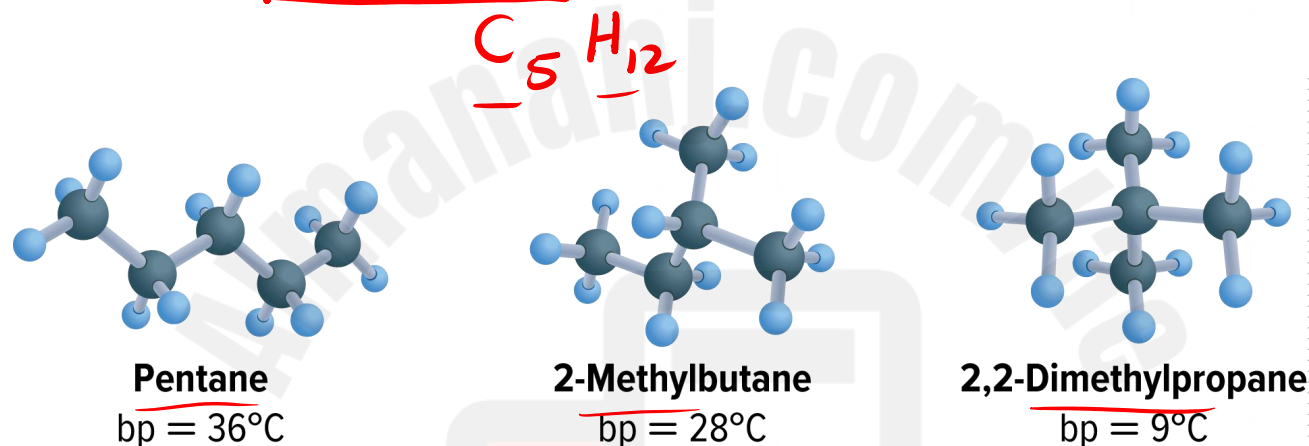
2,2-Dimethylpropane
(bp = 9°C)



bp: boiling point

Quiz

2. What is the best name for the molecules shown below?



1 isomers

3 stereoisomers

2 Structural isomers

4 geometric isomers

Check

different names

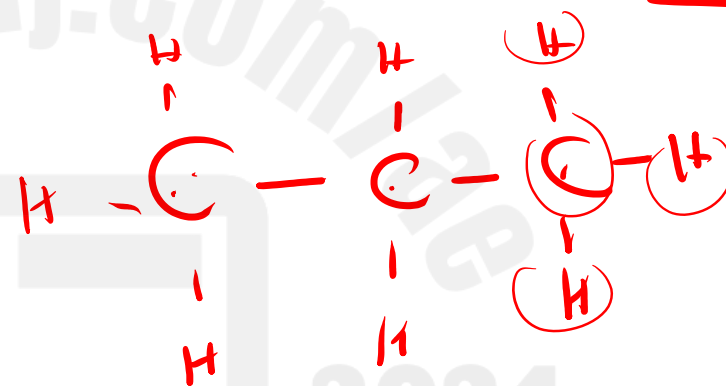
لا يتم يكون اسماء مختلفة
↑

- Which of the following compounds cannot have different structural isomers?

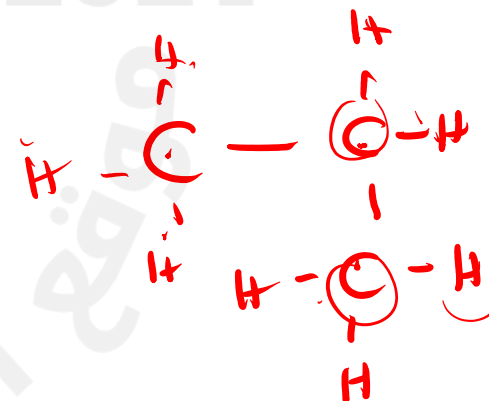
structural isomers for alkanes,
minimum 4 C



propane



propane



propan

Structural Isomers

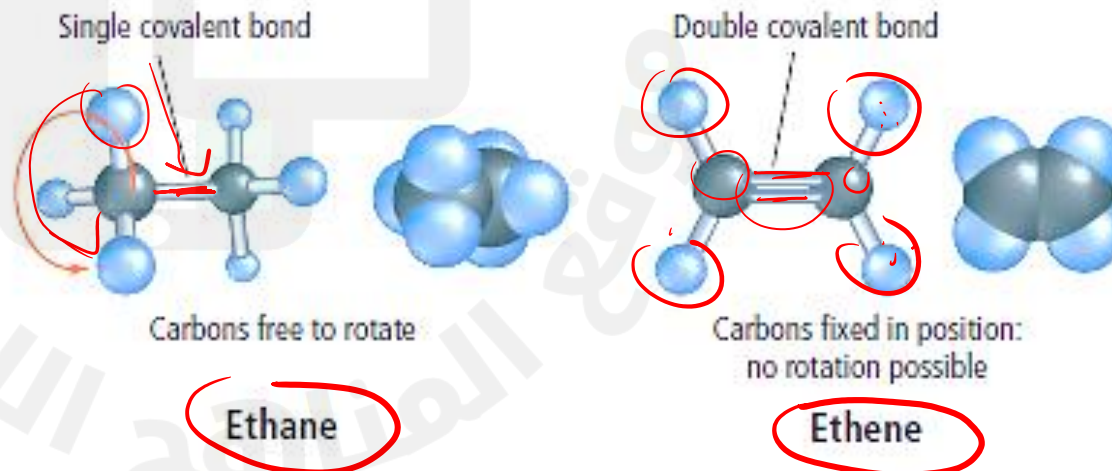
- **Isomers** are two or more compounds that have the same molecular formula but different molecular structures.
- There are two main classes of isomers:
 - **structural isomers**
 - **stereoisomers**

Stereoisomers

- are isomers in which all atoms are bonded in the same order **but are arranged differently in space.**
- There are two types of stereoisomers:
 - ✓ **Geometric isomers,** *double bond Alkenes*
 - ✗ Optical Isomers: “Chirality”, mirror images (right- and left-handed form).

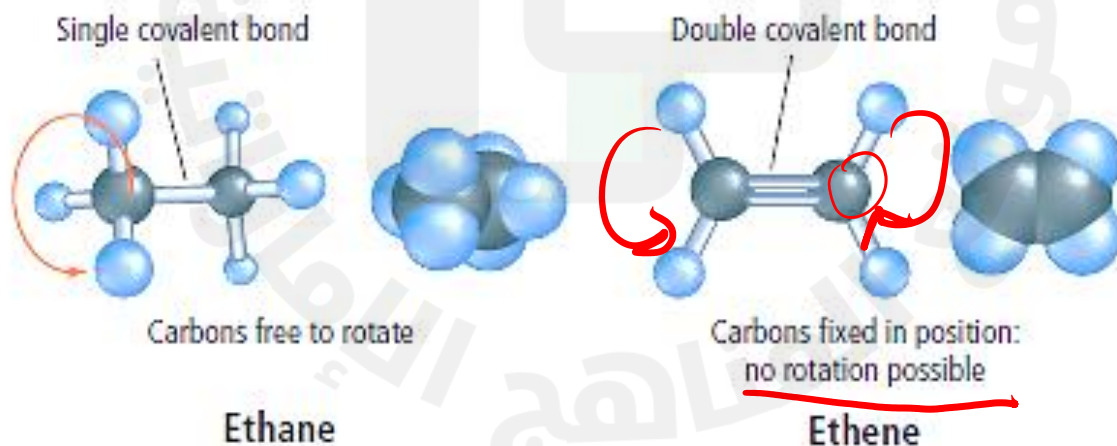
The **single-bonded carbons** in ethane are free to rotate around the bond.

The **double-bonded carbons** in ethene resist being rotated.



Stereoisomers

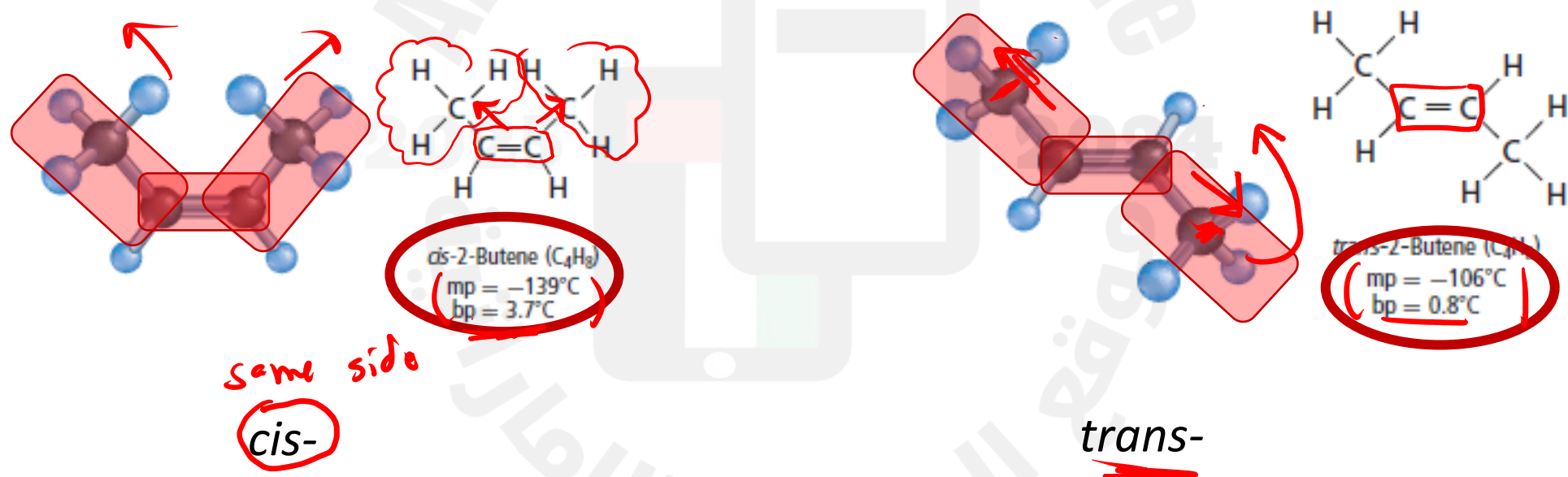
- here are two types of stereoisomers:
- One type occurs in **alkenes**, which contain **double bonds**. Two carbon atoms with a single bond between them can rotate freely in relationship to each other.
- However, when a second covalent bond (**double bond**) is present, the carbons can no longer rotate; they are locked in place.



Geometric isomers happen in Alkenes

Alkene

Isomers resulting from different arrangements of groups around a double bond are called geometric isomers.



Quiz

not in the same side

3. Which term that means across from is used to describe and name stereoisomers?

A trans

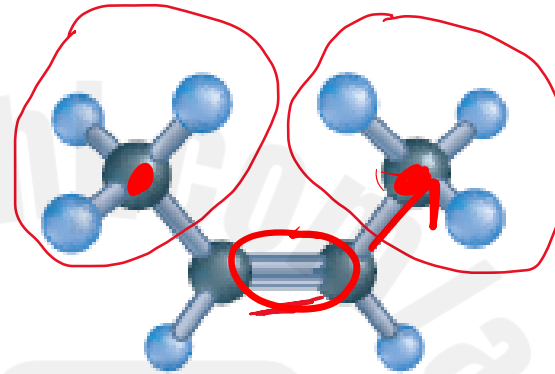
C levo

B levo

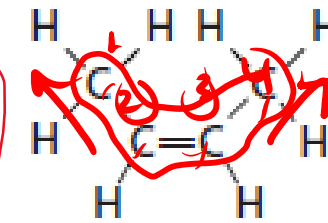
D cis

Stereoisomers

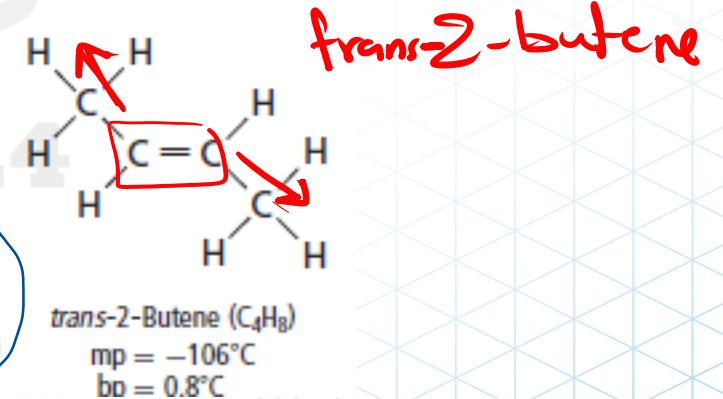
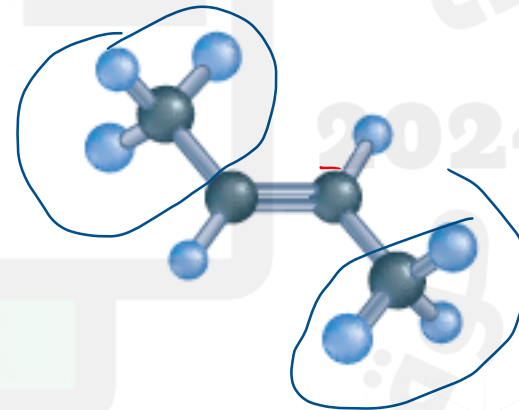
- Isomers resulting from different arrangements of groups around a double bond are called geometric isomers.
- Cis** means the branches are on the same side, of the double bond
- trans** means the branches are across from each other.
- Geometric isomers have different physical and chemical properties.



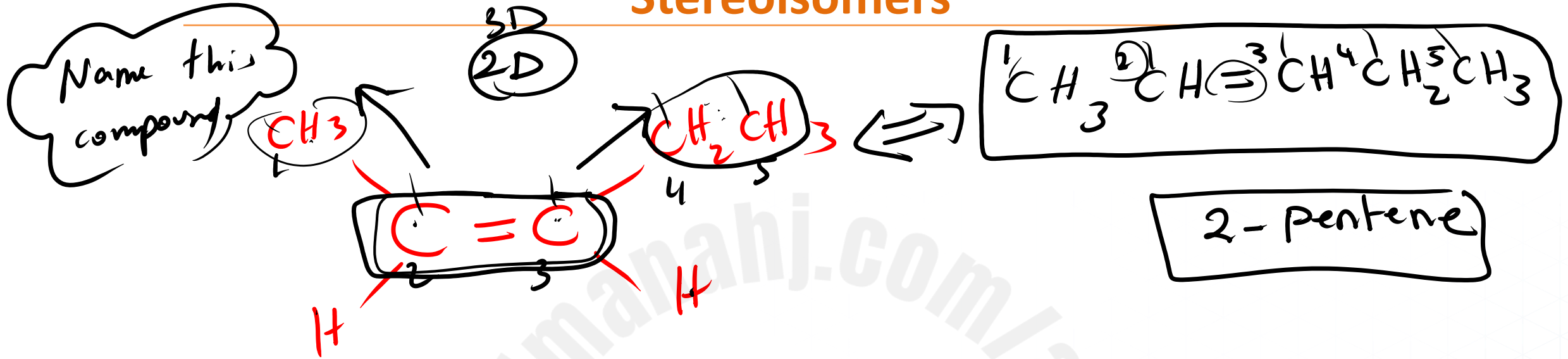
Cis-2-butene



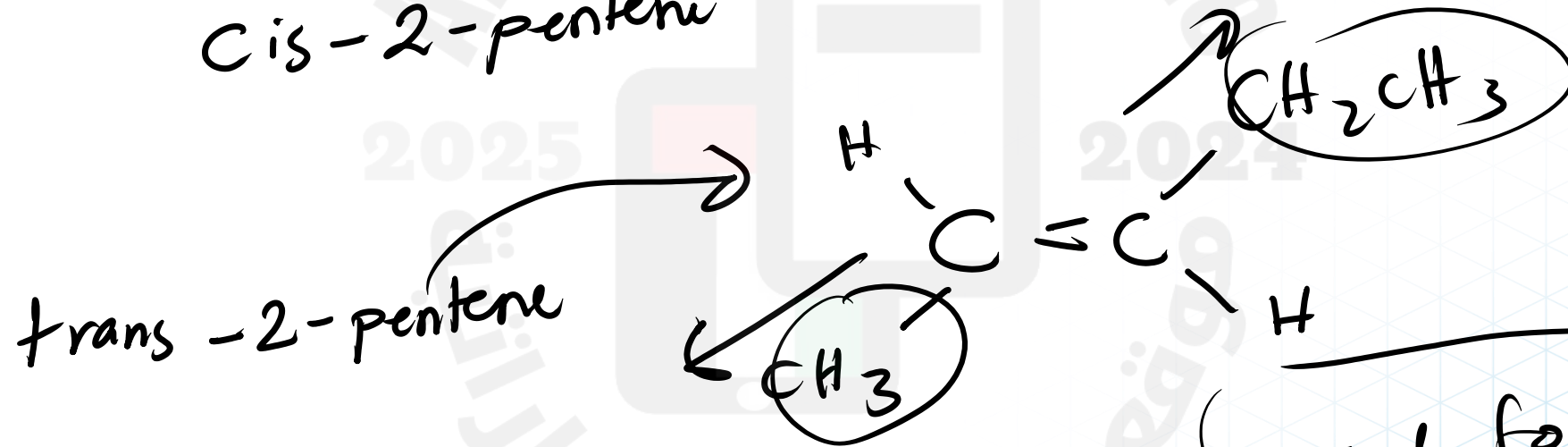
cis-2-Butene (C_4H_8)
mp = $-106^\circ C$
bo = $3.7^\circ C$



Stereoisomers



Cis-2-pentene



End for 12 adu
11 adu
-C

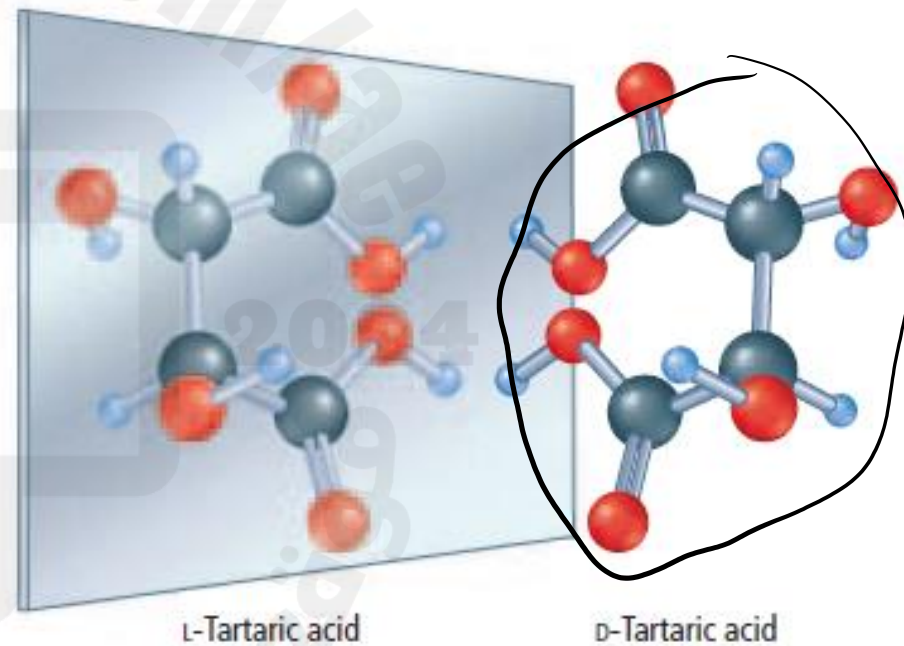
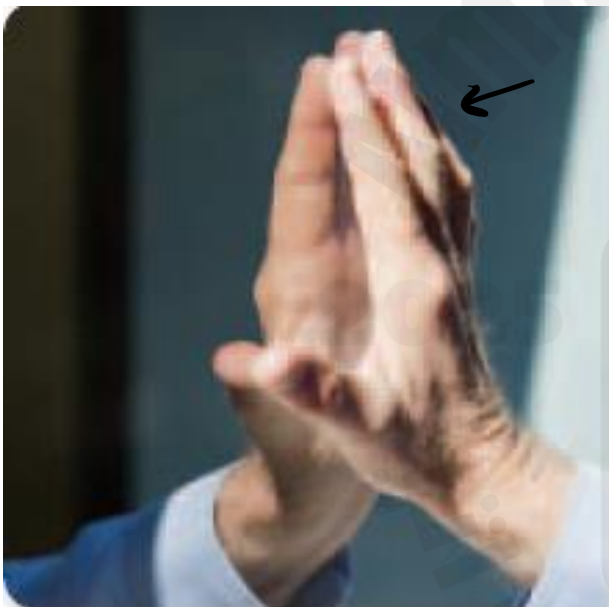
Optional: Chirality

- Louis Pasteur discovered two forms of tartaric acid that were mirror images of each other.
- They were called right- and left-handed forms.
- Today, these two forms are called d-tartaric acid and l-tartaric acid.
- Dextro- means to the right, and levo- means to the left.
- The property in which a molecule exists in a right- and left-handed form is called **chirality**.

Chirality

- The property in which a molecule exists in a right- and left-handed form is called **chirality**.

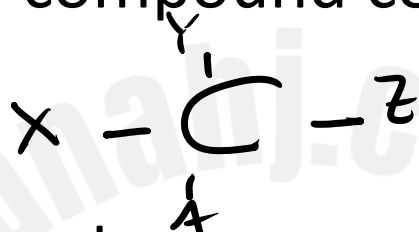
mirror
image



Molecules of D-tartaric acid and L-tartaric acid resemble each other in the same way that your right hand and left hand resemble each other. The reflection of your right hand looks the same as your left hand.

Optical Isomers

- Chirality occurs whenever a compound contains an asymmetric carbon.

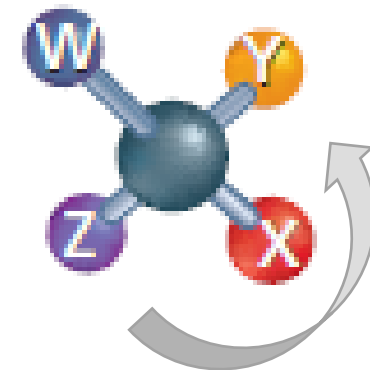
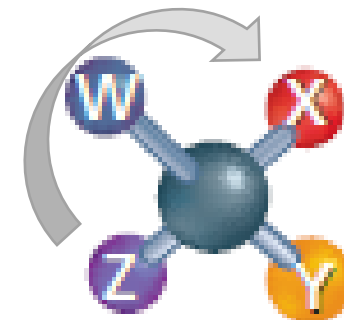
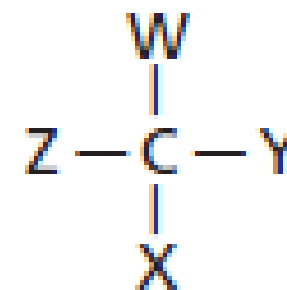
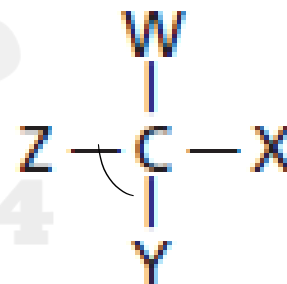
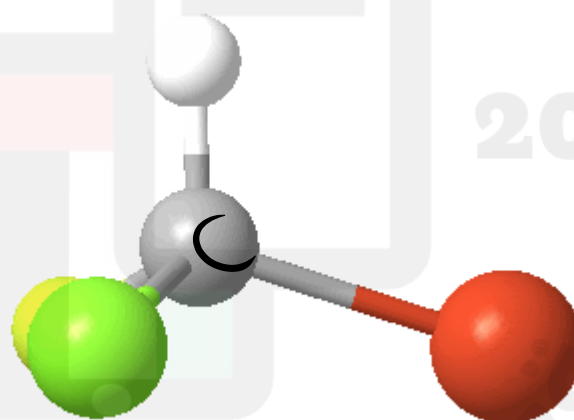
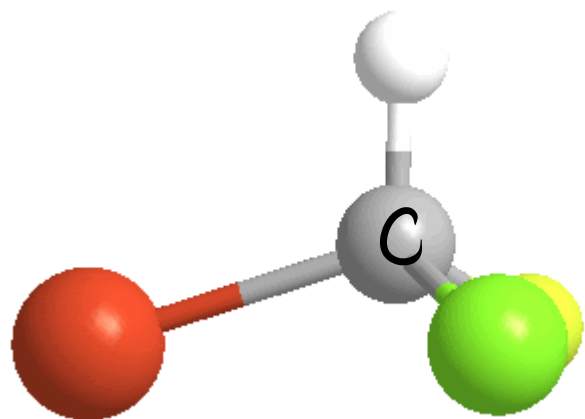


- An **asymmetric carbon** is a carbon atom that has four different atoms or groups of atoms attached to it.
- The four groups can always be arranged in two different ways.

(Optical Isomers)

- **asymmetric carbon:** is a carbon atom that has four different atoms or groups of atoms attached to it.

chirality = mirror images



Stereoisomers: Optical Isomers

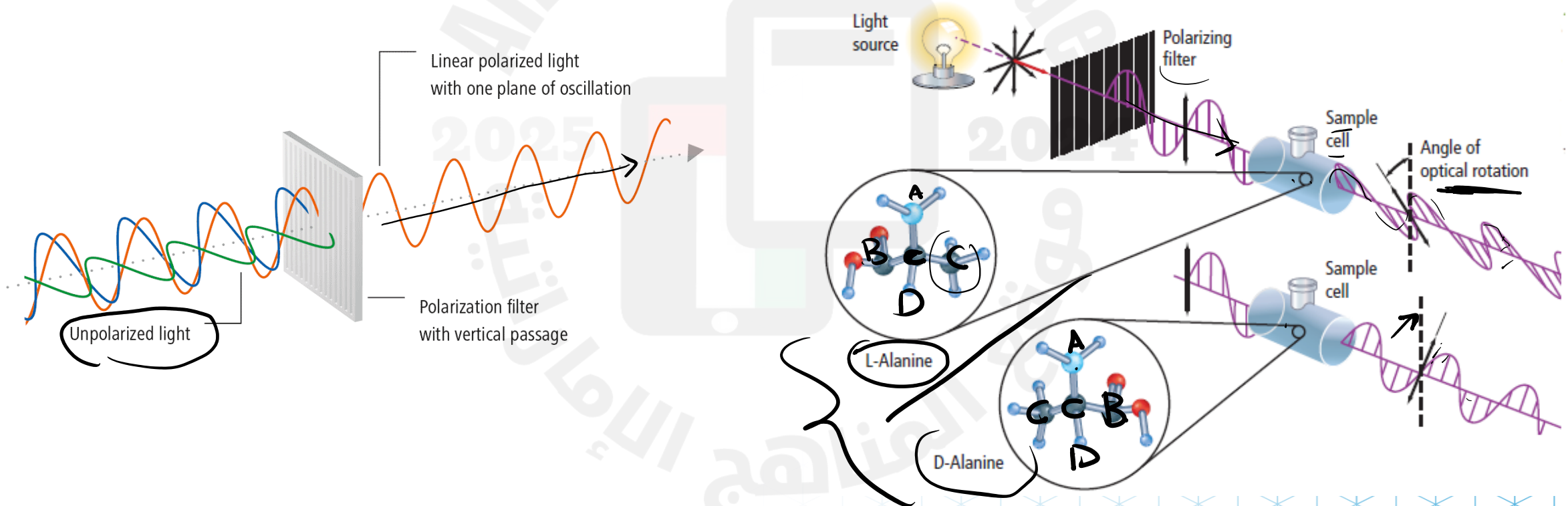
- Isomers that result from different arrangements of four different groups around the same carbon atom are called **optical isomers**.

Chiral carbon

- Optical isomers have the same physical and chemical properties, except in chemical reactions where chirality is important, such as enzyme-catalyzed reactions in biological systems.

Optical Isomers

- Optical isomers affect light passing through them.
- When polarized light passes through a solution containing an optical isomer, the plane of polarization is rotated to the right by a *d*-isomer or to the left by an *l*-isomer, producing an effect called **optical rotation**.



Quiz

4. The reflection of your right hand looks the same as your left hand. However, you cannot place your hands palms down with one on top of the other and have matching parts lie on top of each other. What phenomenon does this description refer to?

 isomerization

 optical rotation

 B chirality

CORRECT

 polarity

Quiz

5. In which way do optical isomers differ?

☒ A in how they react in some biological systems **CORRECT**

☐ in how they react with each other

☐ in their physical properties

☐ in their chemical properties

Learning Outcomes:

- ✓ **Distinguish** between the two main categories of isomers—structural isomers and stereoisomers.
- ✓ **Differentiate** between geometric isomers with *cis*- and *trans* prefixes.
- ✓ **Describe** the structural variation in molecules that results in optical isomers. ↗



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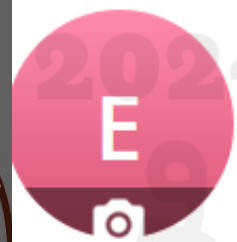
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